

## What is Claimed:

- 1           1.     A system for approximating flux density of light on a retina, the  
2     system comprising:  
3                 a housing defining an inside and having an opening allowing light to  
4     pass to the inside of the housing;  
5                 a baffle coupled to the housing, the baffle replicating the facial cutoff  
6     function for the light passing to the inside of the housing;  
7                 a first detector positioned to detect the light inside the housing, the  
8     first detector producing a photopic spectral response function of the light inside the  
9     housing that approximately replicates a spectral response of foveal cones;  
10                a second detector positioned to detect the light inside the housing, the  
11    second detector producing a scotopic spectral response function of the light inside  
12    the housing that approximately replicates a spectral response of rods in the retina;  
13    and  
14                a processor coupled to the first and second detectors, the processor  
15    being configured to calculate a flux density of the light inside the housing based on  
16    the photopic and scotopic spectral response functions.
- 1           2.     The system of claim 1, wherein the first detector includes a first filter  
2     producing the photopic spectral response function and the second detector includes a  
3     second filter producing the scotopic spectral response function.

1           3.     The system of claim 2, wherein the first detector includes a first  
2     photocell producing a first signal weighted by the photopic spectral response function  
3     and the second detector includes a second photocell producing a second signal  
4     weighted by the scotopic spectral response function.

1           4.     The system of claim 3, further comprising a signal transmission means  
2     for transmitting the first and second signals to the processor.

1           5.     The system of claim 1, wherein the first detector includes a first  
2     photocell producing a first signal weighted by the photopic spectral response function  
3     and the second detector includes a second photocell producing a second signal  
4     weighted by the scotopic spectral response function.

1           6.     A system for approximating a flux density of light on a retina, the  
2     system comprising:

3                 a housing defining an inside and having an opening allowing light to  
4     pass to the inside of the housing;

5                 a baffle coupled to the housing, the baffle replicating a retinal spatial  
6     response for the light passing to the inside of the housing;

7                 a first detector positioned to detect the light inside the housing, the  
8     first detector producing a first signal approximately replicating a spectral response of  
9     cones in the retina to the light inside the housing;

10                a second detector positioned to detect the light inside the housing, the  
11     second detector producing a second signal approximately replicating a spectral  
12     response of rods in the retina to the light inside the housing; and

13                a processor coupled to the first and second detectors for receiving the  
14     first and second signals, the processor being configured to calculate a flux density of  
15     the light inside the housing based on the first and second signals.

1           7.     The system of claim 6, further comprising a beam splitter for  
2 transmitting the light inside the housing into at least two directions.

1           8.     The system of claim 6, further comprising a beam splitter for  
2 transmitting a first portion of the light inside the housing toward the first detector  
3 and for transmitting a second portion of the light inside the housing toward the  
4 second detector.

1           9.     The system of claim 6, further comprising a lens coupled to the  
2 housing for focusing the light inside the housing, wherein the baffle surrounds the  
3 lens.

1           10.    The system of claim 6, wherein the first detector includes a first filter  
2 producing the photopic spectral response function and the second detector includes a  
3 second filter producing the scotopic spectral response function.

1           11.    The system of claim 10, wherein the first detector includes a first  
2 photodiode producing a first signal weighted by the photopic spectral response function  
3 and the second detector includes a second photodiode producing a second signal  
4 weighted by to the scotopic spectral response function.

1           12.    The system of claim 6, wherein the first detector includes a first  
2 photodiode producing a first signal weighted by the photopic spectral response function  
3 and the second detector includes a second photodiode producing a second signal  
4 weighted by to the scotopic spectral response function.

1           13.    A method of approximating a peripheral-photopic luminance of light  
2 incident on a combination of foveal and peripheral cones of a retina, the method  
3 comprising the steps of:

4                   producing a first signal weighted by a spectral response of the foveal  
5   cones to the light and proportional to a first flux density of the light received by the  
6   foveal cones;

7                   producing a second signal weighted by a spectral response of rods in  
8   the retina to the light and proportional to a second flux density of the light received  
9   by the rods; and

10                  applying a function to the first and second signals to approximate the  
11   peripheral-photopic response.

1           14.    The method of claim 13, wherein the function comprises the steps of:  
2                  calculating a first luminance on the foveal cones based upon the first  
3   retinal flux;

4                  calculating a second luminance on the rods based upon the second  
5   retinal flux; and

6                  calculating the peripheral-photopic luminance based upon the first and  
7   second luminances.

1           15.    A method of approximating a mesopic retinal flux density of light  
2   incident on a combination of cones and rods of a retina, the method comprising the  
3   steps of:

4                  producing a first signal weighted by a spectral response of the cones to  
5   the light and proportional to a first flux density of the light received by the cones;

6                  producing a second signal weighted by a spectral response of the rods  
7   to the light and proportional to a second flux density of the light received by the  
8   rods; and

9                  applying an algorithm to the first and second signals to determine the  
10   mesopic retinal flux density.

1           16.    The method of claim 15, wherein the function includes the steps of:  
2                    calculating a first photopic luminance based upon the first retinal flux;  
3                    calculating a second scotopic luminance based upon the second retinal  
4 flux;  
5                    calculating a third peripheral-photopic luminance based upon the first  
6 and second luminances; and  
7                    calculating the mesopic flux density based upon the third peripheral-  
8 photopic luminance.

1           17.    A machine-readable storage medium containing a set of instructions  
2 for a general purpose computer, the set of instructions implementing the steps of:  
3                    producing a first signal weighted by a spectral response of the foveal  
4 cones to the light and proportional to a first flux density of the light received by the  
5 foveal cones;  
6                    producing a second signal weighted by a spectral response of rods in  
7 the retina to the light and proportional to a second flux density of the light received  
8 by the rods; and  
9                    applying a function to the first and second signals to approximate the  
10 peripheral-photopic response.

1           18.    A machine-readable storage medium containing a set of instructions  
2 for a general purpose computer, the set of instructions implementing the steps of:  
3                    producing a first signal weighted by a spectral response of the cones to  
4 the light and proportional to a first flux density of the light received by the cones;  
5                    producing a second signal weighted by a spectral response of the rods  
6 to the light and proportional to a second flux density of the light received by the  
7 rods; and

- 8                    applying an algorithm to the first and second signals to determine the
- 9   mesopic retinal flux density.